

THURSDAY, SEPTEMBER 26, 1878

## THE SUPERFICIAL GEOLOGY OF SOUTH-WEST LANCASHIRE

*The Superficial Geology of the Country adjoining the Coasts of South-West Lancashire.* By C. E. De Rance, F.G.S. 1877.

THE memoir of the Geological Survey by Mr. De Rance recently published is an interesting contribution to our knowledge of the superficial deposits of the area between the Mersey and the Ribble, which carries the classification of the Cheshire Plain as far to the north as Morecambe Bay. The whole of this district is covered with glacial drift and recent sands, gravels, and peat-bogs, except here and there where the solid rocks come to the surface in the hills. The drift forms an inclined plane dipping from the hills towards the sea, and probably deposited during subsidence upon an old rocky plain of marine denudation, bounded to the east by a line passing from Eccleston to Euxton and Ribchester, and thence through Broughton, Garstang, and Cockerham to the present sea-margin. Were the superficial deposits stripped off this area, the rock-surface would be seen to be not very far from the present sea-level, although the surface of the ground is often 170 feet above it. This plain also dips gently seaward, and has been worn into hollows by the denuding forces before the glacial period. Very generally it has been cut up into hills and valleys by pre-glacial streams, as, for example, the buried valley of the Mersey described by Mr. Mellard Reade, now filled with 200 feet of sands, gravels, and clays. These buried valleys may be traced inland, rising nearer to the present surface of the ground as we approach the high ground, until at last their tributaries come to the active surface in the higher hills, and are traversed by the same streams as those now finding their way to the surface, and through the accumulation of drift filling their ancient lower courses. It seems tolerably certain that the hill and valley system of Lancashire and Cheshire was produced by sub-aërial agents before the glacial period, and that the ice merely acted on the solid rock by rounding off and smoothing the raw edges left by the streams and rivers. Indeed, as a rule, it may be said that the relative importance of the agency of rain and rivers, and of ice in scenery making is precisely that of chisel and sand paper, the one carves, while the other rounds off, smooths, and polishes. But whatever view may be held of the cause of this uneven surface below the mantle of the drift, it is a most important fact to be noted, that the surface configuration bears little or no relation to the rock-surface below, as engineers have frequently found out by experience in making reservoirs. In one case, for example, the "puddle trench" had to be carried down 160 feet, so as to render a ravine filled with drift water-tight, and this ravine, with the big boulders at the bottom left in the bed of the stream, by which it was hollowed, was intercepted twice in the course of the works.

The drift of the district under consideration is treated by Mr. De Rance in three divisions, the lower and upper boulder clays, separated from each other by the middle

glacial marine sands and gravels. There appears to be no important physical difference between these clays, and their relative age can only be ascertained by their relation to the sands above mentioned. This, however, is not an infallible guide, because there are lenticular strata of sand and gravel intercalated here and there in the boulder clays. According to Mr. De Rance they are absent from the base of the lower boulder clay, a position which Mr. Binney has shown them to occupy in other districts in Lancashire and Cheshire. Our author notices also the glacial striæ, *roches moutonnées*, and the moraines on the higher grounds overlooking his area, and points out very justly (p. 46) that "the till" and "lower moraine drift" of other districts may have been formed at the same time that the lower boulder clay was being accumulated. It may also be pointed out that the local glaciation of North Wales and of the Pennine chain, and of the hills of Cumberland may have been produced while the upper boulder clay was being formed. Nevertheless, we cannot obtain an accurate idea of the relation of the various glacial phenomena to one another in point of time in different parts of Britain, until we can ascertain the sequence and extent of the changes of level, which has not as yet been made out. To my mind three great changes only have been proved to have taken place over a wide area: two periods when Britain stood at a higher level than it does now, with an intervening period, during which the region north of the lower Thames and Severn was submerged to a depth of 1,200 to 1,500 feet on the flanks of Snowdon. There were three corresponding climatal changes, the first period of elevation being marked by a very low temperature; the second, or that of depression, by temperate conditions; and the third or last period of elevation being also marked by severe climatal conditions. It is obvious that, during changes such as these, the sands, gravels, and clays, termed "glacial drift," would be so extremely complicated and so various in different places, that it is difficult, if not impossible, to ascertain the contemporaneity of the more minute sub-divisions of the glacial strata. While sands and shingle were being accumulated along the coast-line, melting icebergs were dropping their burdens to form boulder-clays in the adjacent sea, and on the land the moraines of the retreating glacier were being heaped together, or the advancing glacier was ploughing its way downwards. All these operations were going on simultaneously in different parts of the glacial area of Great Britain, and their results are rendered infinitely more complex by the oscillations of the level of the land, which may have been local, and by changes of climate as yet imperfectly understood. From these considerations it is evident that the clays and shingles and sands cannot be severally classified together, excepting in the strict *homotaxial* sense, and apart from all ideas of contemporaneity, and that the sequence of the minute divisions of the glacial period in Scotland, published by Dr. James Geikie in his able work, and based upon the relation of clays to sands and gravels, cannot in the nature of things apply to Lancashire, or any other areas beyond Scotland. Mr. De Rance has acted prudently in confining his attention to the drifts of the area treated in the memoir without dealing with the general question, which, to my mind, is

not yet sufficiently known to be dealt with in any other fashion than that of the threefold classification of Ramsay, Jamieson, and Lyell. The refinements on this classification attempted by several authors are based upon phenomena which have not yet been proved to be other than local.

One of the more interesting sections of this memoir relates to the growth and accumulation of peat; the author's conclusion that the rate at which peat grows is very uncertain and dependant on local conditions, is confirmed by the recent researches of Dr. Angus Smith, and his observations regarding the manner in which forests have been destroyed by its growth are probably true. The presence, however, of large oaks at great elevations in Britain need not necessarily "point to warmer summers than at present," but may be accounted for by the fact of their having grown in a primeval forest, one under the shelter of another, thus attaining a height and reaching a size which they could not do on our bare hills exposed to the high winds. An example of this may be seen in the fine tall trees growing in the sheltered valley in which Furness Abbey stands, as compared with the stunted growth on the exposed hill-sides around. Nor can the Scotch firs on the peat of the south of England be taken to prove the inclement winters of the prehistoric period, since they now flourish also in the south of England at levels but little above the sea. For the same reason also the peat bogs cannot be looked upon as proving a lower temperature then than now. In Somersetshire the turf moss extending from Glastonbury to Highbridge is growing at the rate of from 4 to 6 feet in fifteen years, so that the places where the peat is cut are filled up in that time. These, however, are unimportant points in a valuable memoir which deals with the district in a very comprehensive manner and in a small space.

It should be remarked, in conclusion, that the price of 17s. for a small octavo of 139 pp. in paper wrappers is without precedent and unreasonable, and that the policy of absurdly high prices for Survey Memoirs, which, as it appears from the two last publications, is being pursued by the Stationery Office, is certain to restrict the sale, and thus render them comparatively useless. They cannot be expected to pay their cost any more than the Reports of Parliamentary Commissions; they ought to be issued at a mere nominal sum, and distributed with a liberality like that shown in similar cases by the American Government.

W. BOYD DAWKINS

#### SCIENTIFIC HORTICULTURE

*The Parks and Gardens of Paris.* By W. Robinson, F.L.S. Second Edition, Revised. (London: Macmillan and Co., 1878.)

THE Science of Horticulture are words often used and too often misused. That there is science in horticulture, or that it is capable of being based on scientific principles, cannot be denied. There is sufficient in the cultivation of plants and flowers, and in their proper disposition in the garden, to occupy a highly refined and cultivated intellect. A garden, according to its dimensions and capabilities, has always been, and is still,

more or less a delight to its owners. Like everything else, the taste exercised in the science of gardening has in different ages shown itself in various ways. The hideous clipping of hedges and shrubs into the forms of animals, birds, &c., still occasionally to be seen in some old English gardens, are records of one of the worst periods of gardening in this country, and the modern system of carpet or ribbon bedding, aptly termed by Mr. Robinson the "coloured cotton handkerchief" style, is not one whit more defensible, but rather, we should say, even more reprehensible, considering what has been done and written of late with the view of elevating public taste in matters of science and art generally.

To no book can we point with so much satisfaction on the subject of laying out or grouping plants or trees in parks or gardens as to that which now lies before us. No writer on this, or on kindred subjects, has discoursed more pleasantly than has Mr. Robinson. That his theme has inspired his pen as that of a ready writer is self-evident; and that he is a true lover of plants for their own sake is also apparent from his frequent references to individual species. But he is something more than this, for it will be found from a perusal of his book that he possesses a thorough knowledge of his subject.

It must not be imagined from the title of the book that the parks and gardens of Paris are, in their entirety, held up for our admiration and imitation. On the contrary the author distinctly points out, and separates the good from the bad, the true from the false, retaining, so to speak, the wheat and consuming the chaff with the fire of a powerful criticism. Notwithstanding this, there can be no two opinions as to the general superiority of the French capital over that of our own in point of picturesque beauty. No visitor to Paris—and no one probably has ever visited that city without visiting also the Bois de Boulogne—can have failed to compare in his own mind the sylvan beauty of the Bois, and the ragged uncared-for appearance of our own London parks; and the contrast is even greater in the squares and gardens of the two capitals, and yet as Mr. Robinson points out, there are excellent sites and splendid opportunities in London to make it a city suitable for other purposes besides those of business and toil. To properly effect this of course architecture and horticulture must join hands. Nevertheless much depends upon a proper provision by the architect for the horticulturist and landscape gardener to exercise their skill. As an illustration of how this may be done, Mr. Robinson draws attention to the new avenue between the new Opera House and the Rue de Rivoli in Paris, and points out that they "have not only been made without cost to the town, but even with a balance on the right side, the vastly increased value of sites for business premises in these new and noble streets having more than repaid the cost of their formation and the removal of the old houses through which they were driven. Abroad, every little capital possessing enough interest to occupy one for two hours, is furbishing up its attractions, while we in London are neglecting advantages the like of which are not possessed by any other city in Europe. The river, the bridges, the suburbs, the surroundings are infinitely superior to Paris, but owing to stupid absence of plan many of the good points are lost, many of the best suburbs being unknown ground even